IEEE P802.11
Wireless LANs

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| HE Receiver Specification |
| Date: 2016-10-27 |
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Abstract

This submission proposes HE Receiver specification Clause to be added in to D0.5 of 802.11ax

Revisions:

* Rev 0: Initial version of the document.

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGax Editor: Editing instructions preceded by “TGax Editor” are instructions to the TGax editor to modify existing material in the TGax draft. As a result of adopting the changes, the TGax editor will execute the instructions rather than copy them to the TGax Draft.***

*Changes to D0.5:*

***TGax Editor: Insert new clause on Receive Specification and rearrange the sections 26.3.17 and 26.3.18.***

**26.3.17 ~~HE Transmit Procedure~~ HE receiver specification**

For tests in this subclause, the input levels are measured at the antenna connectors and are referenced as the average power per receive antenna. The number of spatial streams under test shall be equal to the number of utilized transmitting STA antenna (output) ports and also equal to the number of utilized Device Under Test input ports. Each output port of the transmitting STA shall be connected through a cable to one input port of the Device Under Test.

26.3.17.1 Receiver minimum input sensitivity

The packet error rate (PER) shall be less than 10% for a PSDU with the rate-dependent input levels listed in Table xx-a (Receiver minimum input level sensitivity). The PSDU length shall be 2048 octets shall be used for BPSK modulation with DCM or 4096 octets for all other modulations. The test in this subclause and the minimum sensitivity levels specified in Table xx-a (Receiver minimum input level sensitivity) apply only to non-STBC modes, 800 ns GI, BCC for 20 MHz bandwidth and LDPC for bandwidth greater than 20 MHz, and HE SU PPDUs.

Table xx-a- Receiver minimum input level sensitivity

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Modulation | Code Rate | Minimum sensitivity (20 MHz) (dBm) | Minimum sensitivity (40 MHz) (dBm) | Minimum sensitivity (80 MHz) (dBm) | Minimum sensitivity (160 or 80+80 RU) (dBm) |
| Without DCM | With DCM |
| N/A | BPSK | ½ | -82  | -79 | -76 | -73 |
| BPSK | QPSK | ½ | -82 | -79 | -76 | -73 |
| QPSK | 16-QAM | ½ | -79 | -76 | -73 | -70 |
| QPSK | 16-QAM | ¾ | -77 | -74 | -71 | -68 |
| 16-QAM | N/A | ½ | -74 | -71 | -68 | -65 |
| 16-QAM | N/A | ¾ | -70 | -67 | -64 | -61 |
| 64-QAM | N/A | 2/3 | -66 | -63 | -60 | -57 |
| 64-QAM | N/A | ¾ | -65 | -62 | -59 | -56 |
| 64-QAM | N/A | 5/6 | -64 | -61 | -58 | -55 |
| 256-QAM | N/A | ¾ | -59 | -56 | -53 | -50 |
|  256-QAM | N/A | 5/6 | -57 | -54 | -51 | -48 |
| 1024-QAM | N/A | ¾ | -54 | -51 | -48 | -45 |
| 1024-QAM | N/A | 5/6 | -52 | -49 | -46 | -43 |

**26.3.17.2 Adjacent channel rejection**

Adjacent channel rejection for $W$ MHz (where $W$ is 20, 40, 80, or 160) shall be measured by setting the desired signal’s strength 3 dB above the rate-dependent sensitivity specified in Table xx-a (Receiver minimum input level sensitivity) and raising the power of the interfering signal of $W$ MHz bandwidth until 10% PER is caused for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. The difference in power between the signals in the interfering channel and the desired channel is the corresponding adjacent channel rejection. The center frequency of the adjacent channel shall be placed $W$ MHz away from the center frequency of the desired signal.

Adjacent channel rejection for 80+80 MHz channels shall be measured by setting the desired signal’s strength 3 dB above the rate-dependent sensitivity specified in Table xx-a (Receiver minimum input level sensitivity). Then, an interfering signal of 80 MHz bandwidth is introduced, where the center frequency of the interfering signal is placed 80 MHz away from the center frequency of the frequency segment lower in the frequency of the desired signal. The power of interfering signal is raise until 10% PER is caused for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. Let $∆P\_{1}$ be the difference between the interfering and desired signal. Next, the interfering signal of 80 MHz bandwidth is moved to the frequency where the center frequency of the interfering signal is 80 MHz away from the center frequency of the frequency segment higher in frequency of the desired signal. The power of the interfering is raised until 10% PER is caused for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. Let $∆P\_{2}$be the power difference between the interfering and desired signal. The smaller value between $∆P\_{1}$ and $∆P\_{2}$is the corresponding adjacent channel rejection.

The interfering signal in the adjacent channel shall be a signal compliant with the HE PHY, unsynchronized with the signal in the channel under test, and shall have a minimum duty cycle of 50%. The corresponding rejection shall be no less than specified in Table xx-b (Minimum required adjacent and nonadjacent channel rejection levels).

The test in this subclause and the adjacent sensitivity levels specified in Table xx-b (Minimum required adjacent and nonadjacent channel rejection levels) apply only to non-STBC modes, 800 ns GI, BCC for 20 MHz bandwidth and LDPC for greater than 20 MHz bandwidth, and HE SU PPDUs.

Table xx-b- Minimum required adjacent and nonadjacent channel rejection levels

|  |  |  |  |
| --- | --- | --- | --- |
| Modulation | Code Rate | Adjacent channel rejection (dB) | Nonadjacent channel rejection (dB) |
| Without DCM | With DCM | 20/40/80/160 MHz channel | 80+80 MHz channel | 20/40/80/160 MHz channel | 80+80 MHz channel |
| N/A | BPSK | ½ | 16 | 13 | 32 | 29 |
| BPSK | QPSK | ½ | 16 | 13 | 32 | 29 |
| QPSK | 16-QAM | ½ | 13 | 10 | 29 | 26 |
| QPSK | 16-QAM | ¾ | 11 | 8 | 27 | 24 |
| 16-QAM | N/A | ½ | 8 | 5 | 24 | 21 |
| 16-QAM | N/A | ¾ | 4 | 1 | 20 | 17 |
| 64-QAM | N/A | 2/3 | 0 | -3 | 16 | 13 |
| 64-QAM | N/A | ¾ | -1 | -4 | 15 | 12 |
| 64-QAM | N/A | 5/6 | -2 | -5 | 14 | 11 |
| 256-QAM | N/A | ¾ | -7 | -10 | 9 | 6 |
| 256-QAM | N/A | 5/6 | -9 | -12 | 7 | 4 |
| 1024-QAM | N/A | ¾ | -12 | -15 | 4 | 1 |
| 1024-QAM | N/A | 5/6 | -14 | -17 | 2 | -1 |

The measurement of adjacent channel rejection for 160 MHz operation in regulatory domain is required only if such a frequency band plan is permitted in the regulatory domain.

**26.3.17.3 Nonadjacent channel rejection**

**Nonadjacent channel rejection for** $W$ **MHz channels (where** $W$ **is 20, 40, 80, or 160) shall be measured by setting the desired signal’s strength 3 dB above the rate-dependent sensitivity specified in Table xx-a (Receiver minimum input level sensitivity), and raising the power of the interfering signal of** $W$ **MHz bandwidth until a 10% PER occurs for a PSDU length** of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. The difference in power between the signals in the interfering channel and the desired channel is the corresponding nonadjacent channel rejection. The nonadjacent channel rejection shall be met with any nonadjacent channels located at least $2×W$ MHz away from the center frequency of the desired signal.

Nonadjacent channel rejection for 80+80 MHz channels shall be measured by setting the desired signal’s strength 3 dB above the rate-dependent sensitivity specified in Table xx-a (Receiver minimum input level sensitivity). Then, an interfering signal of 80 MHz bandwidth is introduced, where the center frequency of the interfering signal is placed at least 160 MHz away from the center frequency of the frequency segment lower in the frequency of the desired signal. The center frequency of the interfering signal shall also be at least 160 MHz away from the center frequency of the frequency segment higher in frequency of the desired signal. The power of interfering signal is raise until 10% PER is caused for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. Let $∆P\_{1}$ be the difference between the interfering and desired signal. Next, the interfering signal of 80 MHz bandwidth is moved to the frequency where the center frequency of the interfering signal is at least 160 MHz away from the center frequency of the frequency segment higher in frequency of the desired signal. The center frequency of the interfering signal shall also be at least 160 MHz away from the center frequency of the frequency segment lower in frequency of the desired signal The power of the interfering is raised until 10% PER is caused for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. Let $∆P\_{2}$be the power difference between the interfering and desired signal. The smaller value between $∆P\_{1}$ and $∆P\_{2}$is the corresponding nonadjacent channel rejection.

The interfering signal in the nonadjacent channel shall be a signal compliant with the HE PHY, unsynchronized with the signal in the channel under test, and shall have a minimum duty cycle of 50%. The corresponding rejection shall be no less than specified in Table xx-b (Minimum required adjacent and nonadjacent channel rejection levels).

The test in this subclause and the nonadjacent sensitivity levels specified in Table xx-b (Minimum required adjacent and nonadjacent channel rejection levels) apply only to non-STBC modes, 800 ns GI, BCC for 20 MHz bandwidth and LDPC for greater than 20 MHz bandwidth, and HE SU PPDUs.

The measurement of nonadjacent channel rejection for 160 MHz operation in regulatory domain is required only if such a frequency band plan is permitted in the regulatory domain.

**26.3.17.4 Receiver maximum input level**

The receiver shall provide a maximum PER of 10% at a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations, for a maximum input level of -30 dBm in 5 GHz band and -20 dBm in 2.4 GHz band, measured at each antenna for any baseband HE modulation.

**26.3.18 HE ~~receive~~ transmit procedure**

**26.3.19 HE receive procedure**

**References:**

1. **IEEE P802.11axTM/D0.5, September 2016.**